

LOWELL OBSERVATORY
1400 W. Mars Hill Road
Flagstaff
Coconino County
Arizona

HABS NO. AZ-206

HABS
ARIZ
3-FLAG,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPY OF DRAWING

Historic American Building Survey
National Park Service
Department of the Interior
P.O. Box 37127
Washington, DC 20013-7127

HISTORIC AMERICAN BUILDINGS SURVEY

LOWELL OBSERVATORY

HABS No. AZ-206

HABS
ARIZ
3-FLAG
1-

Location: Lowell Observatory, 1400 West Mars Hill Road, Flagstaff, Coconino County, Arizona.

Present Owner: Percival Lowell Estate, Lowell Observatory.

Present Use: Astronomical observatory and research center.

Significance: The Lowell Observatory, founded in 1894 by Bostonian Percival Lowell, is an important site in the history of astronomy. The Observatory's unique structures and instruments stand as examples of changing technology in the field of astronomy in the nineteenth century. Its mountain top location and placement of separate instruments in separate buildings were forerunners of modern observatory placement and arrangement. Lowell Observatory lead the way in the study of our own solar system. With the help of the Clark dome and 24-inch refracting telescope, Percival Lowell became the world's foremost expert on the planet Mars. Using the 13-inch Pluto telescope, Lowell astronomers discovered Pluto in 1930, making Lowell the only American observatory to have such an honor. Today, Lowell Observatory continues to contribute to our knowledge of our solar system and the stars.

Historian: Rebecca Jacobsen, HABS, summer 1994

Table of Contents

Site Overview	3
The Arizona Expedition of 1894	4
Moving to Mexico	7
Back in Flagstaff	8
A New Dome	9
A New Administration Building	10
A Trans-Neptunian Planet	12
A New Era	13

Site Overview

The Lowell Observatory in Flagstaff, Arizona, has had a unique and colorful history. Founded by wealthy Bostonian Percival Lowell in 1894, Lowell Observatory is the only American observatory to have discovered a planet. Lowell astronomers discovered Pluto in 1930, and have made other important contributions to the study of astronomy as well. Lowell has always lead the way in planetary research, particularly with the planet Mars, and Lowell astronomers have uncovered evidence that lead to the theory that the universe is expanding.

Lowell Observatory was established during years of great change in the tools and architecture of astronomy and the Observatory exhibits a number of these changes. The middle to late nineteenth century was "the age of the great refractors."¹ Instrument makers were supplying observatories with larger, more powerful refracting telescopes than ever before. Lowell Observatory's own 24-inch refracting telescope from the famous instrument maker Alvan Clark and Sons of Massachusetts, was among the largest refractors of its time and was one of the first such telescopes in the southwestern United States. In the early twentieth century, even larger reflecting telescopes were being built. Percival Lowell, who saw to it that his Observatory was supplied with the latest, most advanced equipment, acquired a 40-inch reflecting telescope in 1908.²

With new and larger telescopes came a need for new structures to house the telescopes. Domes became larger, and in the twentieth century there was a shift towards building separate domes for each instrument at an observatory. Traditionally (though not exclusively), observatories had been constructed as one large building with a dominant dome for housing the main telescope, wings for use as office space, and smaller rooms for smaller instruments. With new knowledge of the effects of air turbulence on astronomical observations, domes began to be constructed apart from other structures, and later, were designed with air flow in mind.³ At Lowell, the first permanent dome was a separate structure, and subsequent telescopes were each given their own building. While the observatory was founded in 1894, a central administration building was not constructed until 1916. At Lowell, the choice to build separate structures may be related to the original temporary status of the site, nonetheless, the arrangement of separate buildings for separate instruments was a precursor of future observatory site plans.

Lowell Observatory's mountain location was unique for its time as well. Historically, observatories had been located in close proximity to universities, or in places convenient to the astronomer. Astronomers had begun to realize that the atmosphere

greatly affected the view through the telescope.⁴ William Pickering, a Harvard astronomer, studied the atmosphere and its relationship to the study of astronomy and determined that sites in dry climates and at high elevations provided the best "seeing" quality. Lowell Observatory was placed in the mountains of northern Arizona, a site chosen for its atmosphere, high altitude, and corresponding good "seeing" quality. Lick Observatory was established on Mount Hamilton, California, in 1888 for similar reasons.⁵

The Arizona Expedition of 1894

The event that prompted Percival Lowell to found an observatory in the southwestern United States was an "opposition" of Mars due in 1894. The opposition would provide an excellent opportunity to study the planet while in close proximity to the Earth.⁶ Lowell had been an amateur astronomer since his youth, and had become particularly interested in the planet Mars after astronomer Giovanni Schiapparelli announced in 1877 that he saw "canali" on the surface of the planet. While "canali" meant grooves, or channels, it was erroneously translated into English as canals. Canals, so Lowell and many others believed, could be the work of intelligent life.⁷ Intrigued by the possibility of life on Mars, Lowell made the study of that planet his life's work.

Lowell saw the 1894 opposition as a prime opportunity to study Mars. Initially, the project was to be jointly sponsored by Lowell and the Harvard University Astronomy Department, however, before the project got underway, the University withdrew its interest and support.⁸

Lowell decided to continue with the project himself and the first step in the project was to determine an appropriate site to construct an observatory. For this task, Lowell hired two Harvard University professors: William Pickering and Andrew E. Douglass. Pickering had recently undertaken astronomical work in South America and had written about what he called "seeing" quality. When astronomers view the skies from Earth, they must see things through the Earth's atmosphere. The atmosphere is turbulent and this causes poor "seeing." Pickering determined that some places had better seeing quality than others, and areas with dry climates were especially favorable.⁹ Based on this information, Lowell decided to try the American Southwest for observing sites.

Andrew E. Douglass, an associate of William Pickering, was selected by Lowell to make the trip west. Carrying Lowell's own small 6-inch telescope, Douglass was to travel to Arizona and test the seeing using Pickering's newly devised "scale of seeing."¹⁰ A document in the Lowell Observatory archives entitled "Instructions given to A. E. Douglass regarding his trip to Arizona. Feb. 28,

1894," details Douglass's trip. Interestingly, Flagstaff was not on the original itinerary. Lowell directed Douglass to visit Tombstone, Tucson, and Phoenix, and then to try other places if the seeing in the first three locations was not satisfactory. Once Douglass arrived in a chosen location, Lowell instructed him to:

ascend the highest accessible elevation and select your proposed site in the vicinity, and do not trust to the possibly biased opinions of any residents. In addition to the regular observations, make a trip of at least a mile into the woods somewhere, and observe two nights if practicable. Observations should also be made . . . at the top and at the base of same hill up from 200 to 1000 feet in elevation. It is possible that these latter investigations can be made best after work on the dome has been begun, especially the hill observations.¹¹

By March 1894 it was clear that none of the original sites would be appropriate. On the 18th of that month, Douglass wrote to Lowell to suggest Prescott as a suitable site. Lowell sent Douglass a telegram in reply that said simply, "After Prescott try Flagstaff."¹² In Flagstaff, Douglass encountered the best seeing of the entire expedition. A month later, Lowell sent another telegram, this one bearing the message, "Your telegram just received decides me; Flagstaff it is."¹³

Flagstaff, Arizona, in 1894 was still a small frontier town. In Douglass's opinion, however, it had "fair stores and many pleasant people."¹⁴ Flagstaff boasted hotels, a general store, a sawmill, a number of saloons, and a railroad line. The town was pleased that it was being considered as the site for a new observatory. Dennis M. Riordan, owner of the local sawmill, was instrumental in encouraging Douglass to locate in Flagstaff. Riordan provided Douglass with a place to stay while he was making his initial observations in the area and later, Riordan would encourage his fellow Flagstaff residents to welcome the Observatory by offering 10-15 acres of land wherever Douglass chose to locate. The local citizenry also offered to build a wagon road to the observatory site.¹⁵

In a handwritten document entitled "Facts pertaining to the Arizona Expedition" dated March 1, 1894, William Pickering described the purposes of the Arizona trip. He wrote:

Objects. (a) The study of Mars during its present opposition.

(b) The study of the Moon, planets and particularly the phases of Jupiter's satellites.

(c) The determination of the atmospheric and local conditions which will furnish the best site for an astronomical observatory.¹⁶

In time, the three objectives of the "Arizona Expedition" would become long term research goals of the Observatory. Percival Lowell himself would become famous for his Mars research, and the Lowell Observatory would become one of the only observatories to pursue research of the solar system when others turned their attention to the stars. The interest in atmospheric conditions and their relationship to observing would also continue. In fact, the Lowell Observatory was among the first observatories to be placed according to seeing quality, and not the close proximity of a University.

With a site selected and land and a wagon road donated by the city, Douglass could finally begin erecting a temporary dome. The dome itself was designed by William Pickering, partly constructed in the East, then dismantled and shipped by rail to the Flagstaff site.¹⁷ Ground was broken for this dome on April 23, 1894. While the dome was enroute to Flagstaff, the base was being constructed on the site. For this job, Douglass hired local laborers including Edgar Whipple and Godfrey Sykes.¹⁸ The base and the dome were both made of wood, with almost no foundation. The assembly of Pickering's temporary dome did not go as easily as planned. Once the dome arrived and was placed atop the base, it was discovered that the dome did not turn smoothly. A rotating dome was necessary in order for the sky to be viewed in all directions. Douglass noted in May 1894 letter that they were having trouble with the wheels on which the dome was to rotate, and nine out of the eighteen had to be reset.¹⁹

The six inch telescope that Douglass carried with him to search for a suitable site would not be sufficient to carry out the proposed study of Mars in the new dome, so William Pickering made arrangements to borrow telescopes for this purpose. From Harvard University he secured a 12-inch refractor, and from Alfred Brashear, a lens maker from Pittsburgh, Pennsylvania, he borrowed a recently completed 18-inch refractor.²⁰ Both telescopes were shipped by rail to the new site. Percival Lowell arranged to have Alvan Clark and Sons, instrument makers from Cambridgeport, Massachusetts, build a mounting to hold both telescopes simultaneously.²¹ With the dome completed and telescopes secured, both Lowell and Pickering arrived in Flagstaff in late May 1894.²² Lowell, Pickering, and Douglass spent the remainder of the summer making observations of Mars.

At the end of the summer, Pickering and Lowell returned east, leaving Andrew Douglass to remain in Flagstaff for the winter. Douglass was to continue with his observations and send regular

reports back to Lowell in Boston. Unfortunately, the good quality of seeing that first led Douglass to Flagstaff had become very elusive. There were many nights when Douglass could not observe at all due to heavy cloud cover. Winter snows in Flagstaff did not help the situation either. Conscious of the weather, Stanley Sykes, the brother of Godfrey Sykes who helped erect the temporary dome, provided Douglass with his own revised "scale of seeing." He said that "10 is when you can see the moon. 5, is when you can still see the telescope. 1, is when you can only feel the telescope but not see it."²³

Moving to Mexico

With the poor quality of seeing during the winter of 1894-95, the following spring, Lowell began to talk of giving up the Flagstaff site and moving elsewhere. In a letter to Douglass dated March 5, 1895, Lowell wrote, "The seeing seems to be so perpetually poor now that I see little use in keeping up the observatory longer. . . . My plan at present is to find another site for the opposition and to ship the dome as it is to wherever that may be. . . ."²⁴ While Lowell seemed intent on giving up the Flagstaff site, he planned to continue with his work. In the same letter, he noted, "I have agreed with Clark for a 24 inch [telescope] to be finished by June 1, 1896."²⁵

Douglass officially closed the Observatory in April 1895 and sent the borrowed telescopes back east.²⁶ He spent part of that year again searching for suitable sites, this time in Mexico. However in the spring of 1896, things were happening again in Flagstaff. A note from Lowell to Douglass dated May 1, 1896 said, "I have seen Mr. Clark and think the old dome can be made to do at least temporarily at Flagstaff."²⁷ The new 24-inch telescope Lowell had ordered from Alvan Clark and Sons would be ready soon and was to be mounted at the Flagstaff site until another site could be found.

Lowell chose Tacubaya, Mexico, as the new site for observing. The 1896 Mars opposition could be better seen from that location.²⁸ Meanwhile in Flagstaff, local laborers worked on a new telescope dome to replace the temporary 18-inch dome. The new dome was larger than the first to accommodate the new 24-inch telescope. It was designed and built by Godfrey Sykes, the local "handyman" who helped erect the 18-inch dome. In order to have the dome ready for the 1896 Mars opposition, the dome had to be built quickly. Local pine was used as the framing material because it could be gotten quickly. Other contemporary domes such as those at Lick Observatory in California and Yerkes Observatory in Wisconsin were being framed of harder wood or metal. Designed to be "portable" as it would soon be shipped to Mexico, the new 24-inch dome had an unusual shape--which Sykes described as an "inverted bucket."²⁹ Traditionally, domes were hemispherical as the 18-inch dome had

been. However, Sykes felt that the pine used for framing was not sturdy enough to support a large dome in the hemispherical shape.³⁰

By December 1896, the dome, the 24-inch telescope, and Percival Lowell were all in Tacubaya, ready to begin observing Mars. Lowell and his assistants spent the winter in Mexico making observations of Mars and other heavenly bodies, but while the trip was considered successful, Lowell decided to return to Flagstaff in the spring. Apparently the seeing in Mexico was no better than the seeing in Flagstaff, and the government was more stable in the United States. In April 1897, Douglass and company were back in Flagstaff, reassembling the dome on the site of the original 18-inch telescope dome.

Back in Flagstaff

Since Flagstaff was now the permanent site of the Lowell Observatory, some changes were made to the 24-inch dome structure. The outer covering of the dome was changed from canvas to thin sheet metal. The canvas observing doors on the top and side of the dome were replaced with metal doors. A few years later, in 1899, Stanley Sykes tried unsuccessfully to make the dome rotate on pontoons in a water track instead of its original iron wheels.³¹ The method was abandoned because the water in the track froze in Flagstaff's cold winter weather.³²

Other things changed at the Flagstaff site after the return from Mexico. A tiny wood frame structure that had been constructed in 1894 to temporarily house astronomers was taken over by Percival Lowell and enlarged. The structure, nicknamed the "Baronial Mansion," was covered in wood shingles and was added to almost continually over the years, giving it an eclectic appearance. It was occupied by the family until the 1950s when it was torn down because of its deteriorating condition.³³

Another early structure on the Observatory site was a barn. Venus, the Observatory cow, lived in the barn with a few other animals. Venus provided some income for the observatory as her calves were sold to the Babbitt Brothers general store. The barn was constructed in 1901 and was located well south of the house and dome.³⁴

Staffing patterns at the Observatory changed drastically shortly after the return from Mexico. Percival Lowell himself became ill and did not continue with his work in Flagstaff for several years.³⁵ He expected his assistants to continue his Mars research, unfortunately, all of the people he hired in the last years of the nineteenth century had left or been fired by 1900. Even A. E. Douglass, who had been Lowell's mainstay in Flagstaff, disagreed with Lowell over research methods and publications and was

dismissed in 1901.³⁶ At the turn of the century, Lowell, his health regained, was forced to find new staff members.

Although he was hesitant, in 1901 Lowell agreed to hire Vesto Melvin Slipher, an young man from Indiana University at Bloomington. In a letter to fellow astronomer Wilbur Cogshall, Lowell wrote:

I shall be happy to have him [Slipher] come when he is ready. I have decided, however, that I shall not want another permanent assistant and take him only because I promised to do so; and for the term suggested. What it was escapes my memory. If, owing to this decision, he prefers not to come, let him please himself.³⁷

Slipher did come to Flagstaff, and in his "temporary position" stretched out to over fifty years. Many of these years were spent as Observatory director after Lowell's death in 1916.³⁸

Within a few years others joined the staff at Lowell. In 1902, Carl Otto Lampland arrived. With his knowledge of photography, Lampland did a great deal of important work in the relatively unexplored field of planetary photography.³⁹ In 1906, V. M. Slipher's brother, Earl Charles Slipher, also came to Lowell to work as an astronomer. Percival Lowell's secretary, Miss Wrexie Louise Leonard, also spent much time at the Observatory, as did Harry Hussey, who was hired in 1900 as a caretaker for the Clark dome.⁴⁰

With the additional staff came a need for more housing on the hill. In 1902, a structure that became known as "the Lodge" was constructed for the single, male staff members. Located south of the Clark dome and east of the barn, this house served as a "bachelors quarters" until 1908. In that year, V. M. Slipher married, and the house was given to him and his new wife. In later years, the Lodge served as housing for summer interns at the Observatory. A similar courtesy was extended to C. O. Lampland when he married in 1913. Lampland's house was built near a stone water tank just south of the Clark dome. A house built for Harry Hussey in 1906 became the home of E. C. Slipher in 1919, however this structure burned to the ground in 1936.⁴¹

A New Dome

Houses were not the only structures to go up on the Observatory hill. Lowell astronomers had been setting up temporary observing sites all over the hill for specialized observing since the site was established. In 1908, however, Percival Lowell began speaking of building another permanent telescope dome.⁴² He wanted a dome to house a large reflecting telescope with a forty inch mirror, one

of the largest such telescopes of its time. As the relationship between the atmosphere and the quality of seeing was of interest at the Lowell Observatory, the new telescope dome was built in an unusual manner. It was built well into the ground, with only the hemispherical dome showing. It was hoped that by building close to the ground, air turbulence could be avoided. Lowell described this dome in a March 1909 letter to V. M. Slipher:

. . . it seems to me best to sink it in the ground on some hillock to a depth of about 6 feet and then over this to erect a dome about 28 feet in diameter; the excavation need not be to the limit of the whole circumference because the centre of motion is only about 3 to 4 feet at most from the end of the cell. But there should be a track of concrete laid around it for the dome to run on.⁴³

The dome was completed in 1909, and like the Clark dome, it had a wooden frame. Unlike the Clark dome, however, its shape was hemispherical. Unfortunately, the underground location did not solve the air turbulence problem. In fact, the problem was more pronounced close to the ground and the Observatory handyman had to add exhaust fans to improve the seeing in the new dome. C. O. Lampland used this telescope extensively in his work in planetary photography.⁴⁴

A New Administration Building

The next major structure to go up at the Observatory was the Administration Building. Historically, observatories had been built as one large structure housing a dome, office space, and other smaller instrument rooms under one roof. In 1915, Lowell Observatory had more than one dome, a barn, a machine shop, a water tank, and numerous houses, but no administrative structure. Astronomers had been using their own living quarters as office spaces and some sort of central building where all research data could be gathered and made accessible to all was likely desirable.⁴⁵ According to William Putnam in his book The Explorers of Mars Hill, Percival Lowell commissioned his cousin, Guy Lowell, a Boston architect, to "draw up some plans" for the proposed building.⁴⁶ Whether or not Guy Lowell supplied such drawings is unknown, however it is clear from the correspondence between V. M. Slipher and Percival Lowell in 1915 and 1916 that Percival and his wife Constance made the decisions as to how the building would look. Constance was particularly involved with the project, and provided drawings used by the contractors. In a July 15 letter, Slipher gave a general description of the proposed building:

As I remember at our last discussion of the plans (in Mr. Lampland's study) you had in mind the circular front part 40

feet in diameter, rectangular part containing work rooms etc. just north standing long way east and west; --the circular part to extend some distance into the rectangular one.⁴⁷

The building as completed in 1916 had a single story rectangular rear section and a large domed rotunda at center front. The rectangular wings were faced with local malpais volcanic rock. Surrounding the rotunda, and seeming to support the dome, were eight large concrete Doric columns. The dome was designed to resemble Saturn and its rings. The building included office spaces in the rectangular section, a darkroom in the basement, and a library/reception area in the rotunda. The roof of the rectangular section was flat, with parapets along the roof line. The flat roof proved to be a problem in Flagstaff's winters--it leaked under the heavy snows. In 1923, a second story with a steeply pitched hipped roof was added to the building to provide additional office space and to combat the leakage problem.⁴⁸

Unfortunately, Percival Lowell would not live to see the new Administration Building completed. He passed away on November 12, 1916. While Lowell provided generously in his will for the continuation of astronomical studies in Flagstaff, his wife Constance had other ideas. Constance felt that the Observatory and control of Percival's estate were rightfully hers. She contested Percival's will and forced a lengthy court battle which kept operating funds at the Observatory at a minimum. She asked the astronomers and other staff members of the Observatory to take pay cuts while the courts made their decision. In 1925, eight years after Lowell's death, the courts finally found in favor of the Observatory and its trustee, Guy Lowell, Percival's third cousin. Care of the estate, which had shrunk to half its original size due in large part to legal fees, was given to Guy Lowell, who began to build it back up again. Constance had been granted an allowance, and was allowed to live in the Baronial Mansion at the Observatory.⁴⁹

Some of the money that Constance spent during the years of legal difficulty went toward a mausoleum for Percival. Constructed of granite shipped from Massachusetts, the mausoleum was erected just north and east of the Clark telescope dome, the building where Lowell conducted much of his Mars research. Constance Lowell designed the circular, domed building. Completed in 1923, the mausoleum has the same Saturn shape as the rotunda of the Administration Building.⁵⁰

During the first decades of the twentieth century, the Observatory grew not only in the number of structures on the site, but in the size of the site. The first additional acreage added to Flagstaff's original donation was the purchase of 75 acres from the city in 1903 for \$262.50. In 1910, another parcel of land was

secured through a federal land grant.⁵¹ This land, part of the Coconino National Forest, would be occupied in part by the Pluto dome in 1930.⁵² In 1916 another thirteen acres were added, and then an additional nine acres a few years later. With the city of Flagstaff growing at the base of the hill and the threat of light pollution growing with it, the Observatory hoped to distance itself from the city as much as possible through its land acquisitions.

A Trans-Neptunian Planet

By the late twenties, with the legal battle over control of Lowell's estate ended, attention at the Observatory could be once more turned in earnest toward observing the skies. One of Percival's projects before his death had been the search for a planet beyond Neptune. He predicted the existence of such a planet as early as 1905 and had hired a group of assistants to help calculate its theorized location.⁵³ Lowell had made two unsuccessful attempts at finding his "Planet X" and in the late twenties, the staff at Lowell was intent on continuing the search.⁵⁴

Knowing that new, specialized equipment would be necessary for an effective search for Planet X, trustee Guy Lowell set about acquiring a lens for a new telescope. Lowell purchased glass to be ground into a lens, but before anything further could be done, he passed away.⁵⁵ The man to succeed Guy Lowell as trustee was Roger Lowell Putnam, Percival Lowell's nephew. Putnam took over where Guy Lowell left off, securing a new telescope in the search for Planet X. Putnam appealed to his uncle, Percival's brother A. Lawrence Lowell, who was then president of Harvard University, for money to purchase the instrument.⁵⁶ The 13-inch telescope, named the A. Lawrence Lowell telescope in honor of its donor, was housed in a new dome just north of the Administration Building. This dome was completed in 1929, and was a miniature version of the Clark dome.⁵⁷

The method used in searching for the new planet was tedious. Photographs of the area of the sky where the planet was theorized to be were taken on separate nights. Pairs of photographs of the same section of sky were compared to see if any of the tiny lights moved. A planet would appear to shift position, while the stars would not.⁵⁸ To examine the photographic plates, the Observatory hired a young man named Clyde Tombaugh. Approximately one year after the completion of the new dome and the installation of the 13-inch telescope, Tombaugh discovered a "blinking" light on one of the plates. After weeks of checking and re-checking the data, the staff at Lowell Observatory was able to announce that it had found Planet X.⁵⁹ Appropriately, the new planet was named Pluto, a name which continued the pattern of naming planets after Greek and Roman gods. Further, the first two letters of the name were Percival

Lowell's initials. Roger Putnam chose the name and felt it was appropriate to honor the man whose calculations made the discovery possible.⁶⁰

While the discovery of Pluto is perhaps the most famous accomplishment of Lowell Observatory, it is not the only contribution the Observatory has made to astronomy. The fame and importance of the Observatory came first with Percival Lowell and his work relating to the planet Mars. Lowell believed strongly that there was intelligent life on the red planet. He spent years making careful observations of the planet, creating thousands of drawings of its surface, particularly its "canals."⁶¹ While some of his theories, particularly the theory of life on Mars, were proven false, Lowell's intense study of the planet and numerous lectures and publications on the subject made him the foremost expert on Mars of his time.

Other staff members at Lowell made significant contributions to astronomy as well. Vesto M. Slipher's work with spiral nebulae in the early twentieth century led to the theory that the universe is expanding. This theory is central to the study of astronomy today. Carl O. Lampland, who came to Lowell a year after Slipher, made significant contributions in the field of stellar and planetary photography. His photographs of the planet Mars earned him a medal from the Royal Photographic Society.⁶²

A New Era

After the discovery of Pluto in 1930, things at the Observatory slowed down a bit. During World War II, many scientists focused attention on the development of weapons and rockets instead of the study of stars and planets, and the study of astronomy all over the country went on a general hiatus. However, with the end of World War II and the onset of the Cold War, new sources of government funding were made available for the study of sciences, including astronomy. The National Science Foundation was established in 1950 and Lowell was able to take advantage of some of the funding.⁶³ However, it was not until the United States entered the "race to space" that Lowell would come into the spotlight again.

Planetary research had been a mainstay of Lowell Observatory since its founding in 1894. While other observatories across the country focused attention on stars, Lowell astronomers continued to make regular observations of planets, carefully recording the collected data. After Sputnik in 1957, the attention of the nation was turned again to our solar system. With missions planned to the moon, and satellites being sent to planets like Mars and Jupiter, Lowell Observatory was in a unique position to provide data for the planning of these missions.⁶⁴

Lowell Observatory was an active participant in planetary research in the 1950s through the 1970s. In 1954, a unique program called the International Planetary Patrol was organized. The purpose of the planetary patrol was to have observatories all over the world make regular observations of the planets and create a large base of information which could be utilized in future space missions. Lowell Observatory was one of seven observatories to participate in Planetary Patrol.⁶⁵ In 1960, Lowell astronomers were actively involved in a moon mapping project. The 24-inch Clark dome was used extensively in this project.⁶⁶ In 1961, a second International Planetary Patrol was set up. The first planetary patrol materials had been accumulated using such varied equipment at the different observatories that making sense of the data was difficult. The second Planetary Patrol set out to correct this problem by providing the participant observatories with standard equipment. Lowell Observatory was key in helping other observatories set up properly, and also served as a central point for all photographic development. Lowell Observatory did the developing, kept a copy of the material in a central archive, and sent another copy to the observatory that collected the data.⁶⁷

In 1961, Lowell Observatory was named as one of two repositories for planetary data. Three years later, with the help of NASA funding, Lowell Observatory erected a building to house the vast quantity of materials that were accumulated during the Planetary Patrol project. This building was called the Planetary Research Center, and was constructed just south and west of the Lowell Administration Building.⁶⁸

With the renewed interest in the solar system and new sources of scientific funding, Lowell Observatory began to grow once more. The "Chalet," a building first constructed in 1962 for the Ronnie Morgan 24-inch reflecting telescope, had living quarters added to it to accommodate Lowell's visiting scientists.⁶⁹ In 1958, the old machine shop that had been used by Stanley Sykes for many years, was added on to, and became the Aero Chart and Information Center (ACIC). The ACIC was affiliated with the Air Force, and was engaged in the moon mapping project. A new machine shop was erected in the same year near the 40-inch telescope dome.⁷⁰ Because of the increased need for time on the telescopes due to the moon mapping project, another telescope was acquired and a dome built for it in 1963. Additional houses were also built on Mars Hill for various staff members.

Another major addition to the Observatory came in 1959, when Lowell Observatory and Ohio Wesleyan/Ohio State University jointly opened a "dark sky" observing site at Anderson Mesa, approximately twelve miles south and east of Flagstaff. Observing was increasingly difficult on Mars Hill with the encroaching lights of the city; a site well away from the city solved this problem. Ohio Wesleyan's

69-inch Perkins reflecting telescope was almost useless in Ohio, so it too was moved to Arizona. Several of Lowell Observatory's telescopes were also placed at Anderson Mesa, including a new 40-inch telescope, and the 13-inch Pluto telescope. Soon, much of the work that had been done on Mars Hill was being done at Anderson Mesa.⁷¹

In 1994, the Observatory celebrated its 100th anniversary, and at the same time opened the Steele Visitors Center. The center includes exhibit space and lecture halls, as well as a gift shop. Guided tours of the site start at the visitors center. In the words of trustee William Lowell Putnam, ". . . a major part of the Steel Visitors" Center has been designed to show the tools of the astronomer, the current topics of research by the Lowell staff and what the future might hold."⁷²

PART III. SOURCES OF INFORMATION

A. Architectural Drawings: There are some drawings and/or blueprints for the Administration Building, Clark Dome and Pluto Dome. In some cases, the set is not complete and/or is undated. Drawings are located in the Archives of the Lowell Observatory, Planetary Research Center, Flagstaff, Arizona. Many of these blueprints are currently uncataloged.

B. Early Views: There is an extensive set of early photographs of the Administration Building, Clark Dome and Pluto Dome, as well as other structures at Lowell Observatory. Views are of both interiors and exteriors. There are also views which show the buildings under construction, thus revealing important information as to construction techniques, etc. The photographs are located in the Archives of the Lowell Observatory, Flagstaff, Arizona, and are stored in photo albums, located in the basement vault of the Administration Building. The photographs depict the building from construction through the early twentieth century.

C. Interviews:

Robert Millis, July 16, 1994, Interview with author, Lowell Observatory, 1400 W. Mars Hill Road, Flagstaff, Arizona, Observatory Director.

Gerald McGlothlin, July 1, 1994, Interview with author, Lowell Observatory, 1400 W. Mars Hill Road, Flagstaff, Arizona, Observatory Groundskeeper.

Kathy Kramer, May 31, 1994, Interview with author, Lowell Observatory, 1400 W. Mars Hill Road, Flagstaff, Arizona, Observatory Public Relations Specialist.

D. Bibliography:

Butowsky, Dr. Harry A. Astronomy and Astrophysics National Historic Landmark Theme Study. Washington, D.C.: National Park Service, 1989.

Cline, Platt. Mountain Town: Flagstaff's First Century. Flagstaff, Arizona: Northland Publishing, 1994.

Donnelly, Marion Card. A Short History of Observatories. Eugene, Oregon: University of Oregon, 1973.

Hoyt, William Graves. Lowell and Mars. Tucson: The University of Arizona Press, 1976.

Letters of Constance Lowell, 1915-1917. Archives, Lowell Observatory, Flagstaff, Arizona.

Letters of Percival Lowell, 1915-1916. Archives, Lowell Observatory, Flagstaff, Arizona.

Letters of Vesto Melvin Slipher, 1915-1917. Archives, Lowell Observatory, Flagstaff, Arizona.

Lowell Observatory Correspondence, 1915-1916. Archives, Lowell Observatory, Flagstaff, Arizona.

"... But Few Intimates in Boston Knew Of Intention To Marry." The Boston Herald. 11 June 1908. n. pg. Photocopy.

McAlester, Virginia, and Lee McAlester. A Field Guide to American Houses. New York: Alfred A. Knopf, 1992.

Pickering, William. "Facts Pertaining to the Arizona Expedition: March 1, 1894." MS. Uncataloged papers. Archives, Lowell Observatory, Flagstaff, Arizona.

Putnam, William Lowell. The Explorers of Mars Hill: A Centennial History of Lowell Observatory. West Kennebunk, Maine: Phoenix Publishing, 1994.

Slipher, Vesto Melvin. Letter to Roger Lowell Putnam. 3 December 1927. Vesto Melvin Slipher letters. Archives, Lowell Observatory, Flagstaff, Arizona.

Sykes, Godfrey. A Westerly Trend. Tucson: Arizona Pioneers Historical Society, 1944.

Sykes, Stanley. "A Diary of Floating the Dome." Uncataloged papers. Archives, Lowell Observatory, Flagstaff, Arizona.

PART IV. PROJECT INFORMATION

The Lowell Observatory Recording Project was sponsored by the Arizona State Historic Preservation Office, Kenneth Travous, Executive Director, and Lowell Observatory, Robert Millis, Director. The documentation was undertaken by the Historic American Buildings Survey (HABS) division of the National Park Service, Robert Kapsch, Chief, with Joseph Balachowski, Architect, and Catherine Lavoie, Historian, supervising. The project was completed in the summer of 1994 at Lowell Observatory, Flagstaff, Arizona. The recording team included Maggie Ross, team supervisor, Christina Radu, Schaeffer Somers, and Tom Hetrick, architect technicians, and Rebecca Jacobsen, historian. Rebecca Jacobsen conducted all research relating to the project and completed the historic structures reports, with Catherine Lavoie editing. Site photographs were taken by Brian Grogan.

Notes:

Marion Card Donnelly, A Short History of Observatories (Eugene, Oregon: The University of Oregon, 1973), 105.

William Lowell Putnam, The Explorers of Mars Hill (West Kennebunk, Maine: Phoenix Publishing, 1994), 137..

Donnelly, 108.

Ibid., 115.

Donnelly, 115.

Putnam, Explorers of Mars Hill, 15.

William Graves Hoyt, Lowell and Mars (Tucson: University of Arizona Press, 1976), 55.

Ibid., 31.

Putnam, Explorers of Mars Hill, 14.

Ibid.

"Instructions Given to A.E. Douglass Regarding his trip to Arizona," MS, Uncataloged Papers, Archives, Lowell Observatory, Flagstaff, Arizona, 1. While this document does not have the name of the author, the handwriting is similar to that of William Pickering, Harvard professor and Percival Lowell's assistant.

Percival Lowell, telegram to A. E. Douglass, March 1894, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Percival Lowell, telegram to A. E. Douglass, 16 April 1894, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Andrew E. Douglass, letter to Percival Lowell, 12 April 1894, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Platt Cline, Mountain Town: Flagstaff's First Century (Flagstaff, Arizona: Northland Publishing, 1994), 60.

LOWELL OBSERVATORY
HABS NO. AZ-206 (page 18)

William Pickering, "Facts Pertaining to the Arizona Expedition: march 1, 1894," MS, Uncataloged Papers, Archives, Lowell Observatory, Flagstaff, Arizona, 1.

Putnam, Explorers of Mars Hill, 19.

Cline, 61.

Andrew E. Douglass, letter to Percival Lowell, 16 May 1894, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Putnam, Explorers of Mars Hill, 19.

Ibid.

Ibid., 18.

Andrew E. Douglass, letter to Percival Lowell, 14 January 1895, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Percival Lowell, letter to A. E. Douglass, 5 March 1895, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Ibid.

Hoyt, 52.

Percival Lowell, letter to A. E. Douglass, 1 May 1896, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Putnam, Explorers of Mars Hill, 27.

Godfrey Sykes, A Westerly Trend (Tucson: Arizona Pioneers Historical Society, 1944), 235.

Ibid.

Stanley Sykes, "A Diary of Floating the Dome," MS, Uncataloged Papers, Archives, Lowell Observatory, Flagstaff, Arizona.

Kathy Kramer, interview with the author, 31 May 1994.

Putnam, Explorers of Mars Hill, 150.

Ibid., 151.

Ibid., 29.

Ibid., 41.

Percival Lowell, letter to Wilbur Cogshall, 7 July 1901, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Putnam, Explorers of Mars Hill, 268.

Hoyt, 129.

Putnam, Explorers of Mars Hill, 268.

Ibid., 131-133.

LOWELL OBSERVATORY
HABS NO. AZ-206 (page 19)

ibid., 134.

Percival Lowell, letter to V. M. Slipher, 16 March 1909, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Putnam, Explorers of Mars Hill, 139.

Vesto Melvin Slipher, letter to Percival Lowell, 5 January 1915, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Putnam, Explorers of Mars Hill, 141.

Vesto Melvin Slipher, letter to Percival Lowell, 15 July 1915, Archives, Lowell Observatory, Flagstaff, Arizona, Percival Lowell letters.

Putnam, Explorers of Mars Hill, 141.

Ibid., 102-102.

Ibid., 147.

Ibid., 126-127.

Vesto Melvin Slipher, letter to Roger Lowell Putnam, 28 March 1928, Archives, Lowell Observatory, Flagstaff, Arizona, Vesto Melvin Slipher letters.

Hoyt, 271-272.

Ibid., 268; 278.

Putnam, Explorers of Mars Hill, 176.

Roger Lowell Putnam, letter to V.M. Slipher, 30 June 1927, Archives, Lowell Observatory, Flagstaff, Arizona, Vesto Melvin Slipher letters.

Vesto Melvin Slipher, letter to Roger Lowell Putnam, 3 December 1927, Archives, Lowell Observatory, Flagstaff, Arizona, Vesto Melvin Slipher letters.

William Lowell Putnam, A Yankee Image: The Life and Times of Roger Lowell Putnam (West Kennebunk, Maine: Phoenix Publishing, 1992), 141.

Putnam, Explorers of Mars Hill, 178.

Putnam, A Yankee Image, 96.

Hoyt, 59.

Putnam, Explorers of Mars Hill, 44; 201.

Ibid., 190.

Ibid., 212.

Ibid., 226.

Robert Millis, interview with the author, 16 July 1994.

Putnam, Explorers of Mars Hill, 227.

Ibid., 155.

Ibid., 153.

Ibid., 149.

Ibid., 170-171

Ibid., 156.